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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/751,349	01/05/2004	Kirkland D. Broach	ARF 2004-003	2219

7590 11/16/2005

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EXAMINER
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GREENE, DANIEL LAWSON

ART UNIT	PAPER NUMBER
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3663

DATE MAILED: 11/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/751,349	BROACH ET AL.	
	Examiner	Art Unit	
	Daniel L. Greene Jr.	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                            | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/1/2005 has been entered.

### *Oath/Declaration*

2. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

It does not state that the person making the oath or declaration has reviewed and understands the contents of the specification, including the claims, as amended by any amendment specifically referred to in the oath or declaration.

Further, it is not seen where any factual evidence is presented within the declaration. It is noted that Mr. Young's statements alone without presentation of factual evidence can only be construed as an opinion. The Office regrets to inform applicant that no patentable weight can be given to an opinionated declaration. Consequently, said declaration cannot be relied upon as an adequate response to the issues presented in the previous office action mailed 3/2/2005.

**Please note that no weight is given to an opinion declaration on the ultimate Legal conclusion in issue. See In re Lindell, 155 USPQ 251. See also In re Pike et al, 84 USPQ 235.**

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**3. Claims 1, 2 and 4-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.**

A. Applicant's 9/1/2005 amendment introduced the limitation "...with adjacent chamfers at different angles to the axial direction of said fuel rods." to claims 1, 12 and 13. This limitation is considered new matter since it is not seen where the specification uses such a phrase in the application as filed.

B. Applicant's 9/1/2005 amendment introduced the limitation "...wherein the flaring at the lower face of said plate comprises a series of a plurality of discrete

chamfers with adjacent chamfers at different angles to the axial direction of said fuel rods.” to claims 1 and 12. This limitation is considered new matter since it is not seen where the specification uses such a phrase in the application as filed.

C. Claim 13 contains the limitation “double inlet chamfer” in the second to last line. It is not seen wherein the specification as filed discloses a chamfer with two inlets.

4. **Claims 1, 2 and 4-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

A. Applicant’s 9/1/2005 amendment introduced the limitation “...with adjacent chamfers at different angles to the axial direction of said fuel rods.” to claims 1, 12 and 13. There is no adequate description nor enabling disclosure of what all is meant by and encompassed by the phrase “...with adjacent chamfers at different angles to the axial direction of said fuel rods”. See the discussion of this issue in section 3 above.

B. Applicant’s 9/1/2005 amendment introduced the limitation “...wherein the flaring at the lower face of said plate comprises a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of said fuel rods.” to claims 1 and 12. There is no adequate description nor enabling

disclosure of what all is meant by and encompassed by the phrase "...wherein the flaring at the lower face of said plate comprises a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of said fuel rods." See the discussion of this issue in section 3 above.

C. Regarding claim 13, there is no adequate description nor enabling disclosure of what all is meant by and encompassed by the phrase "double inlet chamfer" See the discussion of this issue in section 3 above.

**5. Claims 1, 2 and 4-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

A. There is no proper antecedent basis for all terms present. See for example "adjacent chamfers" in claims 1, 12 and 13, "discrete chamfers" in claims 1, 2 and 12, "different angles" in claims 1, 12 and 13, "the double angle chamfer" in claims 4 and 14, "double angle inlet chamfer" in claim 15, etc.

B. Claims 1 and 12 are vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "a series" because the figures only show one or two chamfers not a series. The term "series" connotes a broader meaning than the two adjacent chamfers disclosed within the specification. Additionally a series of a plurality of discrete chamfers does not connote any particular chamfers, per se, hence the metes and bounds of the claim are undefined.

C. Claims 1 and 12 are vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "a plurality" because the figures only show one or two chamfers. The term "plurality" connotes a broader meaning than the one or two adjacent chamfers disclosed within the specification. Additionally a plurality of discrete chamfers does not connote any particular chamfers, per se, hence the metes and bounds of the claim are undefined.

D. Claims 1, 12 and 13 are vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "adjacent chamfers at different angles to the axial direction of said fuel rods" because it appears the angles need only be different "to the axial direction of said fuel rods" NOT to each other. The claim language does not specifically disclose what the angles are different to, the axial direction or each other, hence the metes and bounds of the claim are undefined.

E. Claim 13 is vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "double inlet chamfer" because a chamfer with two inlets has not been disclosed, hence the metes and bounds of the claim are undefined.

F. Claim 2 is vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "the discrete chamfers" because this limitation does not specifically disclose exactly "which" discrete chamfers of the series of a plurality of discrete chamfers are being referred to, hence the metes and bounds of the claim are undefined.

H. Applicant's 9/1/2005 amendment introduced the limitation "...with adjacent chamfers at different angles to the axial direction of said fuel rods." to claims 1, 12 and 13. The claims are vague indefinite and incomplete as to what all is meant by and encompassed by the phrase "...with adjacent chamfers at different angles to the axial direction of said fuel rods." See the discussion of this issue in section 3 above.

I. Applicant's 9/1/2005 amendment introduced the limitation "...wherein the flaring at the lower face of said plate comprises a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of said fuel rods." to claims 1 and 12. The claims are vague indefinite and incomplete as to what all is meant by and encompassed by the phrase "...wherein the flaring at the lower face of said plate comprises a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of said fuel rods." See the discussion of this issue in section 3 above.

J. Claims 1, 12 and 13 are vague, indefinite and incomplete in what all is meant by and encompassed by the limitation "type" because the use of the word "type" does not concisely describe applicant's invention. See MPEP § 608.01(b), hence the metes and bounds of the claim are undefined.

K. Claim 17 is vague, indefinite and incomplete in what all is meant by and encompassed by the phrase "Chamfer C is at the outlet of the flow through holes" since the claim does not specify the relative dimensions of chamfer C, hence the metes and bounds of the claim are undefined.



***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**6. Claims 1, 2, and 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger in view of either the Mechanical Engineering Handbook, CRC Press LLC, ©1999 or the Industrial Burners Handbook, CRC Press LLC ©2003 or the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958 for the reasons set forth in section 4 of the 3/2/2005 Office action.**

Applicant's arguments filed 9/1/2005 have been fully considered but they are not persuasive. Applicant's arguments presented in response to the 9/23/2004 Office action were completely addressed in the 3/2/2005 Final Office action and are incorporated herein by reference.

Applicant's amendments to the claims have not defined over the references of record. The flaring at the lower face of horizontal plate (46) of Shallenberger does indeed comprise a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of said fuel rod wherein it is understood that the entire chamfer (50) is indeed made up of,

contains, and comprises a series of a plurality of individually discrete chamfers that when considered as a whole, make up the entire chamfer. For example, Shallenberger Figure 7, Item (50) can be considered not only as one chamfer, but also a plurality, or series of chamfers, i.e. chamfer (50) can be made by several different passes of chamfer making device, the first pass making only the first one millimeter of the chamfer, the second pass making the second millimeter, etc. until the chamfer reaches the desired depth. However in and of itself, the one chamfer alone can be considered to be made up of any number of discrete chamfers simply by choosing what exactly delineates a discrete chamfer. By stating that one discrete chamfer is one millimeter long then it appears chamfer (50) is made up of a plurality of approximately 4 to 5 discrete chamfers in series.

It is noted that the claim language does not require adjacent chamfers to be at different angles to each other, only the axial direction of the fuel rods.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a double chamfered inlet in the flow holes of a bottom nozzle of a fuel assembly and applying a venturi design to the flow holes of a nuclear fuel assembly such that no adverse impact arises within the down stream flow pattern within the environment of a nuclear core) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from

the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

It is further noted that Claims 1 and 12 do not preclude the Examiners interpretation of the claim language because the terms “comprising” and “having” directly preceding the limitations “a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of the fuel rods” and “discrete double inlet chamfer” do not limit the claim to only those embodiments disclosed. The terms “comprising” and “having” are open ended, meaning that at least the claimed limitations must be present, however there may be other items present than only those listed. Accordingly, Applicant’s claim language does not define over the references as explained above.

**7. Claims 1, 2, and 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger in view of any of U.S. Patent 4,997,621 to Johansson et al.('621), U.S. Patent 5,528,640 to Johansson et al.('640),U.S. Patent 5,473,650 to Johansson ('650) or U.S. Patent 5,488,634 to Johansson et al ('634).**

Shallenberger discloses claim 1, a fuel assembly (10) for a nuclear reactor including a plurality of elongated nuclear fuel rods (22) having an extended axial length, at least a lowermost grid (20) supporting said fuel rods (22) in an organized array and having unoccupied spaces (52) defined therein adapted to allow flow of fluid coolant there through and past said fuel rods (22) when said fuel assembly (10) is installed in the nuclear reactor and a plurality of guide

thimbles (18) extending along said fuel rods (22) through and supporting said grid (20), a debris filter bottom nozzle (12) disposed below said grid (20), below lower ends of said fuel rods (22), supporting said guide thimbles (18) and adapted to allow flow of fluid coolant into said fuel assembly (10), said debris filter bottom nozzle (12) comprising a substantially horizontal plate (46) extending substantially transverse to the axis of the fuel rods (22) and having an upper face directed toward said lowermost grid (20), said upper face of said plate (46) having defined there through at least two different types of holes, the first type being a plurality of holes (66) receiving lower ends of said guide thimbles (18) where they are supported by said plate (46) and the second type being a plurality of flow through holes (48) extending completely through said plate (46) for the passage of coolant fluid from a lower face of said plate to the upper face of said plate, each of said coolant flow through holes (48) extending substantially in the axial direction of said fuel rods (22), in fluid communication with said unoccupied spaces (52), and in the extended direction at least some of said coolant flow through holes (48) having a profile substantially of a venturi, in Figures 1-10 and column 3 lines 24-54 and 67+, and columns 4-6, wherein it is understood that the entire chamfer (50) is indeed made up of, contains, and comprises a series of a plurality of individually discrete chamfers that when considered as a whole, make up the entire chamfer. For example, Shallenberger Figure 7, Item (50) can be considered not only as one chamfer, but also a plurality, or series of chamfers, i.e. chamfer (50) can be made by several different passes of chamfer making

device, the first pass making only the first one millimeter of the chamfer, the second pass making the second millimeter, etc. until the chamfer reaches the desired depth. However in and of itself, the one chamfer alone can be considered to be made up of any number of discrete chamfers simply by choosing what exactly delineates a discrete chamfer. By stating that one discrete chamfer is one millimeter long then it appears chamfer (50) is made up of a plurality of approximately 4 to 5 discrete chamfers in series.

If applicant is of the opinion that Shallenberger does not disclose discrete chamfers as explained by the examiner, then as shown by '634 Figure 5, '640 Figures 13, 15, 17, '650 Figures 5 and '621 Figures 5-E, at the time of the invention it would have been obvious to one of ordinary skill in the art to include discrete chamfers with adjacent chamfers at different angles to the axial direction of the fuel rods for the benefits of having highly sensitive control over increasing the pressure drop through the coolant channel ('621 column 7 lines 17-33). It is considered that '621 Fig 5E discloses discrete chamfers that read on item (95) and (70), '650 Figure 5 discloses discrete chamfers at the bottom of item 59 the black line just above the lower surface of item 30, i.e. just above indicia (56) on the left and just above indicia (58) on the right. '634 Fig 5 also discloses discrete chamfers which are considered the three horizontal lines above the bottommost line '640 discloses discrete chamfers in Fig 17 the lines just below indicia (260).

**While patent drawings are not drawn to scale, relationships clearly shown in the drawings of a reference patent cannot be disregarded in determining the**

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**patentability of claims. See In re Mraz, 59 CCPA 866, 455 F.2d 1069, 173 USPQ 25 (1972).**

It is noted that the claim language does not require adjacent chamfers to be at different angles to each other, only the axial direction of the fuel rods.

Shallenberger also does not disclose that the flow through holes (48) include a flaring at both ends.

All of the secondary references teach the use of flaring both ends of the coolant flow passages in the lower support plate of nuclear fuel assemblies in order to create venturi profiles for the benefits of minimizing pressure loss and maximizing the debris catching functions. See, for examples '634 Figure 5, column 4 lines 5-42, and column 8 lines 19-25, '650 Figures 3, 5, 9, and '621 Figures 4, 5C-E (particularly Figure 5D item (90)) and column 7 lines 17-33.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to provide flaring at both ends of the flow through holes, because of the advantages and benefits of increased flow, reduced pressure losses, smoother downstream flow, etc., as such results are no more than basic mechanical principles of fluid flow dynamics available within the art.

Claim 7 is clearly disclosed in Shallenberger, column 8 lines 2-26.

Claim 8 is clearly disclosed in Shallenberger, Fig 1 and column 5 lines 1-6

Claim 9 is clearly disclosed in Shallenberger, Figures 3 and 6.

Claims 10 and 11 are clearly disclosed in Shallenberger, column 8 lines 2-

Claim 12 is clearly disclosed in the rejection of corresponding parts above.

It is further noted that Claims 1 and 12 do not preclude the Examiners interpretation of the claim language because the terms "comprising" and "having" directly preceding the limitations "a series of a plurality of discrete chamfers with adjacent chamfers at different angles to the axial direction of the fuel rods" and "discrete double inlet chamfer" do not limit the claim to only those embodiments disclosed. The terms "comprising" and "having" are open ended, meaning that at least the claimed limitations must be present, however there may be other items present than only those listed. Accordingly, Applicant's claim language does not define over the references as explained above.

**8. Claims 4, 6 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger as modified by either the Mechanical Engineering Handbook, CRC Press LLC, ©1999 or the Industrial Burners Handbook, CRC Press LLC ©2003 or the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958 as applied to claims 1, 2 and 7-12 above and further in view of further teachings of the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958.**

With regard to claims 4, and 13-16, Shallenberger discloses Applicant's invention as modified above, however Shallenberger as modified above does not

disclose that the flow through holes (48) include a double angle chamfer on the inlet end.

Chapter 3 pages 59-65 of the Mechanical Engineering Handbook, SIXTH EDITION, McGRAW-HILL BOOK COMPANY, INC, ©1958 further teach fluid flow through venturi's and orifices and that beveling the sharp upstream edge, even slightly, increases the discharge of an orifice. (see page 3-64 Rounding) Rounding the inlet edge of an orifice can obviously take many forms (Fig. 6), from multiple angle bevels, to rounding. In the case of a rounded edge, it is understood that the inlet angle would be comprised of an infinite number of chamfer angles, including those proposed by applicant.

As stated before, this reference is analogous art because it is teaching the principles of fluid flow through venturi's and orifices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to optimize the flow characteristics of the inlet of the flow holes by increasing the bevel with a double edge chamfer as well as a double angle chamfer approximating a curved surface in order to increase the discharge of the orifice as such results are no more than optimization of the previous art as Applicant's own disclosure states on page 2 lines 3 and page 8 lines 5-7 by using old and well known basic mechanical principles of fluid flow dynamics available within the art.

Claims 6, 16 and 17 are disclosed in The Mechanical Engineer's Handbook SIXTH EDITION, McGRAW-HILL BOOK COMPANY, INC, ©1958



section 3 pages 59 – 65, wherein it is apparent Applicant has translated/converted the table of claim 5 into mathematical equations stemming from typical venturi and orifice geometric relationships. As such, applicants table and values are no more than standard mechanical properties/geometric relationships available within the art.

See MPEP § 2144.05 II “Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” “The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233,235 (CCPA 1955) and *In re Hoeschelle* 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (underlining added)

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger as previously modified by either the Mechanical Engineering Handbook, CRC Press LLC, ©1999 or the Industrial Burners Handbook, CRC Press LLC ©2003 and the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958 as applied to claims 4, 6 and 13-17 above and further in view of further teachings of Chapter 42 Fluid Measurements of The Engineering Handbook, CRC Press LLC, ©2000

Shallenberger as modified above further discloses an inlet chamfer angle of 12 to 15 degrees in column 8, claim 3 lines 27-29, however Shallenberger as

modified does not expressly disclose the chamfer angle of the outlet of the flow through hole.

As previously discussed, the "inlet chamfer A" falls within the range in the rejection of corresponding parts of section 8 above.

Figure 42.6 Venturi Tube teaches that the diffuser section (outlet chamfer C) of a venturi may have an angle range of 5-15 degrees.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to optimize the flow characteristics of the inlet and outlet of the flow holes because of the advantages of increased discharge flow rate, decreased pressure loss of the orifice, etc., as such results are no more than standard practices and well known basic mechanical principles of fluid flow dynamics available within the art.

**See MPEP § 2131.03 II Anticipation of Ranges, MPEP § 2144.05 Obviousness of Ranges as well as MPEP § 2144.05 II "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233,235 (CCPA 1955) and *In re Hoeschelle* 406 F.2d 1403, 160 USPQ 809 (CCPA 1969)**

In response to applicants 12/8/04 argument that MPEP § 2144.05 I and MPEP § 2144.05 II are only directed towards chemical ranges and not

combinations of mechanical angles, it must be understood that these sections are not limited to only those specific cases and particular fields of endeavor, but are used as analogies for other arts and other cases. These cases are generalities showing that "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages." (Underlining added)

In response to applicant's 12/8/04 argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning and that the examiner is using applicant's claimed invention as an instruction manual or template to piece together the teachings of the prior art by trying to isolate ranges rather than considering the combination of ranges, which are claimed together. In and of itself, It would have been prima-facia obvious to one of ordinary skill in the art to optimize Shallenberger by varying the angles of the inlet and outlet orifices, however the Examiner has provided **documentary evidence** showing **more than one reference** has used part if not all of applicant's claimed range of desired coverage, and that those generally knowledgeable in the art are fully aware (and knowledgeable) of the ranges of angles proposed by applicant and, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from

the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

**10. Claims 4, 6 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger as modified by any of U.S. Patent 4,997,621 to Johansson et al.('621), U.S. Patent 5,528,640 to Johansson et al.('640),U.S. Patent 5,473,650 to Johansson ('650) or U.S. Patent 5,488,634 to Johansson et al ('634) as applied to claims 1, 2 and 7-12 above and further in view of further teachings of the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958.**

With regard to claims 4, and 13-16, Shallenberger discloses Applicant's invention as modified and explained in section 7 above, including a series of a plurality of discrete chamfers on the inlet end.

If applicant is of the opinion that Shallenberger does not disclose discrete chamfers as explained by the examiner, then as shown by '634 Figure 5, '640 Figures 13, 15, 17, '650 Figures 5 and '621 Figures 5-E, at the time of the invention it would have been obvious to one of ordinary skill in the art to include discrete chamfers with adjacent chamfers at different angles to the axial direction of the fuel rods for the benefits of having highly sensitive control over increasing the pressure drop through the coolant channel ('621 column 7 lines 17-33). It is considered that '621 Fig 5E discloses discrete chamfers that read on item (95) and (70), '650 Figure 5 discloses discrete chamfers at the bottom of item 59 the

black line just above the lower surface of item 30, i.e. just above indicia (56) on the left and just above indicia (58) on the right. '634 Fig 5 also discloses discrete chamfers which are considered the three horizontal lines above the bottommost line '640 discloses discrete chamfers in Fig 17 the lines just below indicia (260).

Shallenberger as modified in said section 7 above does not disclose that the flow through holes (48) include a double angle chamfer on the inlet end.

Chapter 3 pages 59-65 of the Mechanical Engineering Handbook, SIXTH EDITION, MCGRAW-HILL BOOK COMPANY, INC, ©1958 further teach fluid flow through venturi's and orifices and that beveling the sharp upstream edge, even slightly, increases the discharge of an orifice. (see page 3-64 Rounding) Rounding the inlet edge of an orifice can obviously take many forms (Fig. 6), from multiple angle bevels, to rounding. In the case of a rounded edge, it is understood that the inlet angle would be comprised of an infinite number of chamfer angles, including those proposed by applicant.

As stated before, this reference is analogous art because it is teaching the principles of fluid flow through venturi's and orifices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to optimize the flow characteristics of the inlet of the flow holes by increasing the bevel with a double edge chamfer as well as a double angle chamfer approximating a curved surface in order to increase the discharge of the orifice as such results are no more than optimization of the previous art as Applicant's disclosure states on page 2 lines 3 and page 8 lines 5-7 by using old

and well known basic mechanical principles of fluid flow dynamics available within the art.

Claims 6, 16 and 17 are disclosed in The Mechanical Engineer's Handbook SIXTH EDITION, McGRAW-HILL BOOK COMPANY, INC, ©1958 section 3 pages 59 – 65, wherein it is apparent Applicant has translated/converted the table of claim 5 into mathematical equations stemming from typical venturi and orifice geometric relationships. As such, applicants table and values are no more than standard mechanical properties/geometric relationships available within the art.

**See MPEP § 2144.05 II “Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” “The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233,235 (CCPA 1955) and *In re Hoeschelle* 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (underlining added)**

**11. Claims 4 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shallenberger as modified by any of U.S. Patent 4,997,621 to Johansson et al. ('621), U.S. Patent 5,528,640 to Johansson et al. ('640), U.S. Patent 5,473,650 to Johansson ('650) or U.S. Patent 5,488,634 to Johansson et al**

**('634) as applied to claims 1, 2 and 7-12 above and further in view of U.S. Patent 4,118,973 to Tucker et al.**

With regard to claims 4, and 13-15, Shallenberger discloses Applicant's invention as modified and explained in section 7 above, including a series of a plurality of discrete chamfers on the inlet end.

If applicant is of the opinion that Shallenberger does not disclose discrete chamfers as explained by the examiner, then as shown by '634 Figure 5, '640 Figures 13, 15, 17, '650 Figures 5 and '621 Figures 5-E, at the time of the invention it would have been obvious to one of ordinary skill in the art to include discrete chamfers with adjacent chamfers at different angles to the axial direction of the fuel rods for the benefits of having highly sensitive control over increasing the pressure drop through the coolant channel ('621 column 7 lines 17-33). It is considered that '621 Fig 5E discloses discrete chamfers that read on item (95) and (70), '650 Figure 5 discloses discrete chamfers at the bottom of item 59 the black line just above the lower surface of item 30, i.e. just above indicia (56) on the left and just above indicia (58) on the right. '634 Fig 5 also discloses discrete chamfers which are considered the three horizontal lines above the bottommost line '640 discloses discrete chamfers in Fig 17 the lines just below indicia (260).

Shallenberger as modified in said section 7 above does not specifically disclose that the flow through holes (48) include a double angle chamfer on the inlet end.

Tucker et al. teaches some of the benefits of a flared/double angle inlet chamfer include; an appreciable reduction in pressure loss across the entire apparatus relative to those apparatus without a flared inlet (column 19 lines 22-27), minimization of pressure losses in the inlet due to inlet boundary wall imperfections (column 15 lines 12-22), "having a chamfered inlet portion which is rounded in both the upstream and downstream ends...of the entry portion would further improve the figure of merit (i.e. how well it works) relative to entry portions of the type shown in figures 12 and 13" (column 17 lines 55-60) and "a double chamfered inlet portion with the upstream angle having a steeper angle than the downstream chamfer...would also improve the figure of merit (i.e. how well it works) relative to entry portion in Fig 11 (Fig. 11 is a single chamfer inlet) " (column 17 lines 62+) in addition to Figures 14 and 15, columns 1 lines 19-23, column 14 lines 3-61, and 65+, column 16 lines 1-5, and column 18 lines 1-3.

It is further noted that Tucker et al. sets forth some of the theory behind the motivation to utilize venturi like or flared inlet geometries when dealing with fluid flow in column 14 lines 40-50, i.e. flared inlet portions reduce the fluid acceleration gradients within the inlet portion consequently reducing the associated fluid viscous shear induced pressure losses which are in addition to all other fluid viscous shear induced pressure losses within the system.

Tucker is analogous art because it is teaching the principles of fluid flow through various orifice geometries for the benefits of minimizing pressure losses occurring within said orifices.



At the time of the invention it would have been obvious to a person of ordinary skill in the art to optimize the flow characteristics of the inlet of the flow holes of Shallenberger as modified above by utilizing the teachings of Tucker et al to include a double edge chamfer (Figure 15) as well as a double angle chamfer approximating a curved surface (Figure 14) for the benefits of increasing the discharge of the orifice, minimizing pressure losses, minimizing effects of inlet boundary wall imperfections, etc. as taught to be old and advantageous by Tucker et al. as such results can also be considered no more than optimization of the previous art as even Applicant's own disclosure states on page 2 lines 3 and page 8 lines 5-7 by using old and well known basic mechanical principles of fluid flow dynamics available within the art.

### ***Conclusion***

12. Examiner's Note: Examiner has cited particular columns and line numbers in the references as applied to the claims for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.


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13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. EP0205162A2 discloses various geometries of flow restrictors.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel L. Greene Jr. whose telephone number is (571) 272-6876. The examiner can normally be reached on Mon-Fri 8:30am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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2005-11-10

  
**JACK KEITH**  
**SUPERVISORY PATENT EXAMINER**